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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,799	02/17/2004	G. Allen Vawter	SD7566/S103423	1517

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EXAMINER	
TURNER, SAMUEL A	

ART UNIT	PAPER NUMBER
2877	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H-A

Office Action Summary	Application No.	Applicant(s)	
	10/780,799	VAWTER ET AL.	
	Examiner	Art Unit	
	Samuel A. Turner	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-13,15,18-23,25-32 and 36-39* is/are rejected.

7)☒ Claim(s) *5,14,16,17,24 and 33-35* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *17 February 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1, 4, 7, 9-13, 15, 18-20, 22, 23, 25-32, 36, 38, and 39 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Vawter et al(SAND-2003). Note the differing inventive entities.

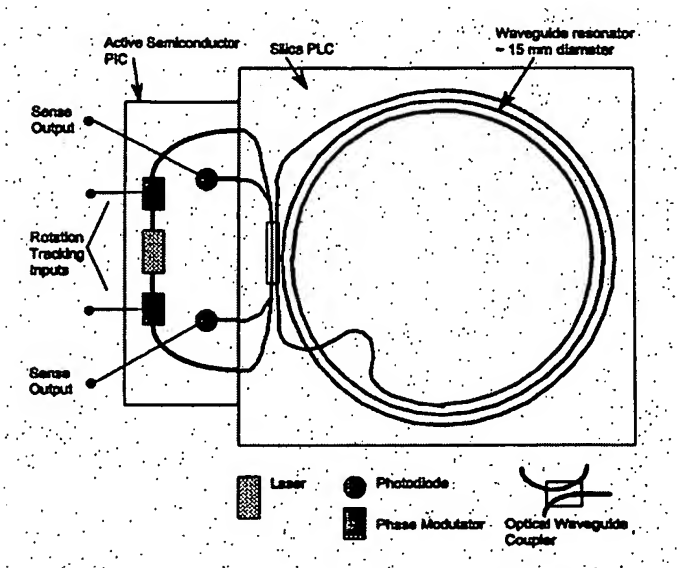


Figure 16 Schematic of resonant micro-optic gyro, RMOG

With regard to claim 1,Vawter et al teaches an integrated optic gyroscope, comprising:

(a) a bidirectional laser source formed on a compound semiconductor substrate and providing a lasing output from each end of the bidirectional laser source(page 29, section 4);

(b) a pair of optical waveguide phase modulators formed on the compound semiconductor substrate to provide a phase modulation for each lasing output from the bidirectional laser source(page 29, section 4);

(c) a plurality of passive optical waveguides formed on the compound semiconductor substrate to direct each lasing output to an edge of the compound semiconductor substrate after passing through one of the optical waveguide phase modulators(page 29, section 4);

(d) a passive ring resonator adapted to receive each lasing output from the edge of the compound semiconductor substrate, to propagate each lasing output around the passive ring resonator in a different direction, and to direct a portion of each lasing output out of the passive ring resonator after propagating around the passive ring resonator(page 29, section 4); and

(e) a pair of waveguide photodetectors formed on the compound semiconductor substrate and optically coupled to the edge of the compound semiconductor substrate, with the waveguide photodetectors receiving the portion of each lasing output from the passive ring resonator and generating therefrom electrical output signals wherefrom a rotation of the passive ring resonator can be determined(page 29, section 4).

As to claim 4, wherein the passive ring resonator comprises a coiled optical waveguide formed on another substrate(page 29, section 4).

As to claim 7, wherein the coiled optical waveguide includes a waveguide crossing(page 30, figure 16).

As to claim 9, wherein the passive ring resonator further includes a 2x2 evanescent waveguide coupler and a pair of 1x2 lateral mode interference splitters to couple each lasing output into the passive ring resonator, and to couple the portion of each lasing output out of the passive ring resonator after propagating around the passive ring resonator(page 30, figure 16).

As to claim 10 wherein the bidirectional laser source comprises a distributed feedback (DFB) laser(page 31, section 4.2).

As to claim 11, wherein the bidirectional laser source and the pair of waveguide photodetectors comprise a plurality of compound semiconductor layers epitaxially deposited on the compound semiconductor substrate, with the plurality of compound semiconductor layers including at least one quantum well therein(page 32, section 4.3.1).

As to claim 12, wherein the optical waveguide phase modulators and the passive optical waveguides are formed from the plurality of compound semiconductor layers with each quantum well therein being disordered or etched away at the locations of the optical waveguide phase modulators and at the locations of the passive optical waveguides(page 32, section 4.3.1).

As to claim 13, wherein the bidirectional laser source is electrically isolated from each optical waveguide phase modulator by an ion-implanted region extending partway through the plurality of compound semiconductor layers(page 31, section 4.2).

As to claim 15, wherein the two substrates are attached together edge-to-edge with a UV-cured epoxy adhesive(page 30, section 4).

With regard to claim 18, Vawter et al teach an integrated optic gyroscope, comprising:

(a) a passive ring resonator formed on a first substrate, with the passive ring resonator further comprising:

(i) a coiled optical waveguide having a plurality of loops(page 30, figure 16);

(ii) a pair of input optical waveguides optically coupled to the coiled optical waveguide to receive lasing light from an edge of the first substrate and to convey the lasing light into the coiled optical waveguide in each of two counterpropagating directions(page 30, figure 16); and

(iii) a pair of output optical waveguides optically coupled to the coiled optical waveguide to receive a portion of the lasing light out from the coiled optical waveguide and to convey the portion of the lasing light to the edge of the first substrate after propagating around the coiled optical waveguide(page 30, figure 16); and

(b) a photonic integrated circuit formed on a second substrate, and further comprising:

(i) a bidirectional distributed feedback (DFB) laser to generate the lasing light and to emit the lasing light from each end thereof(page 31, section 4.2);

(ii) a pair of optical waveguide phase modulators optically coupled to each end of the DFB laser to provide a phase modulation for the lasing light(page 31, section 4.2);

(iii) a passive optical waveguide to convey the lasing light from each optical phase modulator to an edge of the second substrate wherefrom the waveguide lasing light is coupled into the input optical waveguides on the first substrate(page 29, figure 16); and

(iv) a waveguide photodetector to receive the portion of the lasing light from each output optical waveguide on the first substrate and to generate therefrom an electrical output signal indicative of a rotation rate of the passive ring cavity(page 31, section 4.2).

As to claim 19, wherein the first substrate comprises silicon, glass or quartz; and the second substrate comprises a III-V compound semiconductor(page 29, section 4; page 32, section 4.3.1).

As to claim 20, wherein the passive ring resonator, each input optical waveguide and each output optical waveguide comprise a waveguide core surrounded by a waveguide cladding of silica(page 291, section 4).

As to claim 22, wherein the input optical waveguides and the output optical waveguides are optically coupled to the coiled optical waveguide through a 2x2 evanescent waveguide coupler(page 30, figure 16).

As to claim 23, wherein the input optical waveguides and the output optical waveguides are further optically coupled to the coiled optical waveguide through a pair of 1x2 lateral mode interference splitters(page 30, figure 16).

As to claim 25, wherein the coiled optical waveguide includes at least one waveguide crossing(page 30, figure 16).

As to claim 26, wherein the photonic integrated circuit further comprises a plurality of compound semiconductor layers epitaxially grown on the second substrate(page 32, section 4.3.1).

As to claim 27, wherein the plurality of compound semiconductor layers comprise III-V compound semiconductor layers including a pair of low-refractive-index cladding layers sandwiched about a high-refractive-index core layer(page 32, section 4.3.1).

As to claim 28, wherein the high-refractive-index core layer includes at least one quantum well therein(page 32, section 4.3.1).

As to claim 29.The apparatus of Claim 28 wherein each quantum well is disordered within the pair of the optical waveguide phase modulators, and within each passive optical waveguide(page 32, section 4.3.1).

As to claim 30, wherein one of the pair of low-refractive-index cladding layers includes a grating formed therein at the location of the DFB laser(page 32, section 4.3.1).

As to claim 31, wherein an electrical isolation region is provided between each optical waveguide phase modulator and the DFB laser(page 32, section 4.3.1).

As to claim 32, wherein the first and second substrates are attached together at the edges thereof(page 29, section 4).

With regard to claim 36 Vawter et al teach a method for forming an integrated optic gyroscope, comprising steps for:

(a) epitaxially growing on a compound semiconductor substrate a plurality of compound semiconductor layers including at least one quantum well layer(page 32, section 4.3.1);

(b) forming a plurality of active optical elements from the compound semiconductor layers including a bidirectional laser source and a pair of waveguide photodetectors(page 32, section 4.3.1);

(c) disordering or etching away a portion of the compound semiconductor layers and forming therefrom a pair of optical waveguide phase modulators optically coupled to the bidirectional laser source and a plurality of passive optical waveguides, with the passive optical waveguides connecting the pair of the optical waveguide phase modulators and the pair of

waveguide photodetectors to an edge of the compound semiconductor substrate(page 32, section 4.3.1); and

(d) connecting a passive ring resonator to the edge of the compound semiconductor substrate, with the passive ring resonator being optically coupled to the plurality of passive optical waveguides to receive a phase-modulated lasing output from the laser source and each optical waveguide phase modulator, and to direct a portion of the phase-modulated lasing output to each waveguide photodetector after propagating the phase-modulated lasing output around the passive ring resonator(page 30, figure 16).

As to claim 38, wherein the passive ring resonator comprises a coiled optical waveguide formed on a silicon, glass or quartz substrate(page 29, section 4).

As to claim 39, wherein the step for connecting the passive ring resonator to the edge of the compound semiconductor substrate comprises attaching the passive ring resonator to the edge of the compound semiconductor substrate with an adhesive(page 30, section 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2, 3, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vawter et al(SAND-2003).

With regard to claims 2, 3, and 37; Vawter teaches that the prior art configurations used a fiber resonator, fiber and coupler, instead of integrated optics.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Vawter et al apparatus by using the fiber resonator in place of the integrated resonator since both are equivalent resonators and there use is based on size and availability.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vawter et al(SAND-2003) in view of Wong(IEEE-2002).

With regard to claim 6, Vawter et al teach that the PLC is a silica spiral resonator waveguide on a silicon wafer, but fails to teach explicitly that the coiled optical waveguide comprises a waveguide core of silicon nitride surrounded by a waveguide cladding of silica.

Wong teaches that a waveguide core of silicon nitride surrounded by a waveguide cladding of silica is used for birefringence compensation(page 290, section 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Vawter et al apparatus by using a waveguide core of silicon nitride surrounded by a waveguide cladding of silica for birefringence compensation.

Claims 8 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vawter et al(SAND-2003) in view of Suzuki et al(JLT-2000).

With regard to claims 8 and 21, Vawter et al teach that the PLC is a silica spiral resonator waveguide on a silicon wafer, but fails to teach explicitly that the coiled optical waveguide transmits the lasing output in a transverse-electric (TE) polarization state and suppresses any transmission of the lasing output in a transverse-magnetic (TM) polarization state(page 68, section 3).

Suzuki et al teach suppressing either the TE or TM modes in order to reduce polarization noise fluctuations by applying a stress to the waveguide.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Vawter et al apparatus by applying a stress to the waveguide in order to suppress either the TE or TM modes in order to reduce polarization noise fluctuations.

Allowable Subject Matter

Claims 5, 14, 16, 17, 24, and 33-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regard to claims 5 and 24, the prior art of record fails to teach the adiabatic mode-matching region which couples the two different waveguide substrates.

With regard to claims 14, 16, 17, and 33-35; the prior art of record fails to teach the alignment waveguides, lasers, and detectors.

Relevant Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Haavisto(4,661,964) figure 4 and Tai et al(JP363029211A) figure 1.

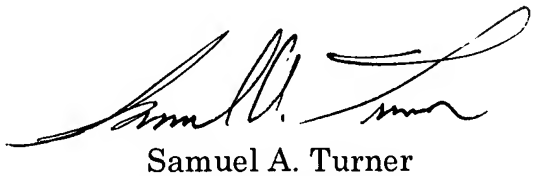
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Samuel A. Turner
Primary Examiner
Art Unit 2877